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ABSTRACT

Science teaching practices at the Long Island School for the Gifted emphasize hands-on experiments where children do the work and the teacher assists learning. This approach bypasses the reading/writing barrier that prevents some children from learning science. Many science experiments are described, including a first-grade lesson on using thermometers, a kindergarten lesson which involves playing with "traffic" lights (colored light bulbs) with light-emitting diodes, and a second-grade lesson on wave motion. The use of problem solving is addressed through experiments in which students manage, using materials found in the classroom, to float a potato, and develop a way to throw a raw egg in the air and have it drop without breaking. Experiments in electronics, chemistry, and biology which were performed during a parents' visit to the third-grade classroom are described. Also included is a diary of a teacher's experiences with a sixth-grade "mechanical genius." (JDD)

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# TEACHING SCIENCE

# TO

# THE GIFTED

BY

Joyce L. Scher

EC 230944

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Paper presented at the Annual Convention
of the Council for Exceptional Children
(68th, Toronto, Canada, April 23-27, 1990)

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**About the Teacher:**

Mrs. Scher received her Bachelor's Degree from Connecticut College for Women in New London, Conn.; her Master's Degree from Long Beach State College in California; and is a Doctoral Candidate at Teacher's College, Columbia in New York.

**About the School:**

The Long Island School for the Gifted is a private school in Huntington, New York that accepts children after testing with I.Q.'s over 130. It is located at 165 Pidgeon Hill Road, Huntington, New York 11746
Halton

The students are bused from 48 communities on Long Island, N.Y. Provisionally chartered by Board of Reagents, NYS Education Dept. in Albany. It offers K-6 and Junior High Program with private music, science, art and gym.

## SCIENCE FOR ALL AMERICA'S CHILDREN

Every day at the Long Island School for the Gifted, my children (who are exposed to hands-on experiments) ask, "what happened?" and "why did that happen?" They do the work, they clean up, and they help each other if there are problems. I believe that this special approach to science education could be our gift to all children studying science.

Come into my classroom and watch what is going on. The children are in the kindergarten, ages 4-6.

Teacher: Open your book and write the word "Air".
Now repeat after me: "Air is There."

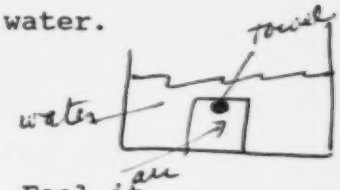
Students: "Air is there!"

Teacher: Each child will now get a dry paper towel and a dry paper cup. The children who sit the best will get the cups and towels first.
(cups and towels are handed to all children)

Teacher: Suppose I tell you that I can put the towel in the cup and put them both in a tub of water and the towel will come out dry. Who believes me?

Students: Heads shaking to indicate that they do not believe me, laughter (Is this a joke?), and finally, one lone hand goes up to indicate that maybe I can do it.

Teacher: Watch me closely: I crumble the towel into a ball, push the towel into the back of the cup, and push the cup straight down into the tub of water. Please count to ten.




Students: One, Two.....Ten.

Teacher: I am taking the towel out of the cup. Feel it.

Student: It is dry.

Teacher: Now take your towel and make it into a ball, push the towel into the cup, and stand on line by the sink. No pushing or touching. Leave a little air between children.

Students line up, put cup in sink, hold for a count of ten, and take out a <u>dry</u> paper towel.

Teacher: How could this happen?

Student: Magic?

Teacher: No! Try again. What is in the cup with the towel? What word did we write in our book today?

Student: AIR

Teacher: YES, AIR! Good for you. If the air is in the cup, the water cannot get in. Everyone say: Air is There.

Students: Air is There.

Teacher: Where is Air? Air is in front of your nose, in the cup, and all around you. The trouble is we cannot see air, so some people forget that air is there.

Teacher: Get ready for the next experiment, Air is Strong.

How wonderful it would be if All America's Children could get their little hands wet this way. The chances are very good that they will reinforce their learning when they go home by showing this experiment to their delighted parents.

Contrast this lesson to the usual situation where a child reads a book, answers a few questions, and forgets the lesson as quickly as possible. Here at Long Island School for the Gifted we have the philosophy that all children can profit from doing experiments; that the standard New York State Curriculum Guide can be supplemented by hands-on experiences; and that the climate should be one of teamwork, trust and cooperation. It should also be noted that most materials are inexpensive, made by the student on the spot, and easy/safe to use.

We also have a large supply of broken machines, such as clocks, toasters, and telephones which serve as a ready source of wires, light bulbs, and magnets. A request once a year to the parents and teachers usually results in more machines than we can use.

As a result of our experiment-hands-on approach to teaching science, our lessons are always enjoyable, and sometimes spectacular! Yet another great advantage is that the experience of doing can bypass the reading/writing barrier that actually prevents some children from learning science. I believe this approach would open up a whole new world for the gifted, for the exceptional, and for the regular student across the country.

I am reminded of a science class of a long time ago in another school where the children could not read or write and felt very stupid; it was in a high school biology class. The lesson was bones and we had no books. Fortunately, my butcher gave me an ENTIRE COW CARCAS which I dramatically wheeled into class in six brown cartons.

Every child got a bone that day, and compared the cow bone to his own human bone, and left class that day repeating aloud the words "tibia", "fibia", and "phalanges". They had to touch, smell, and look at a bone, and were unprepared for the slippery feel, the bloody smell, and the yellow-grey color. That day, they learned BONES FROM BONES, a first-hand experience!

These kinds of experiences can be our gift to All America's Children who learn science.

The Third Grade: PARENTS VISIT ON MAY 4, 1988

Come in and join the parents who will be visiting the third grade today. The children were prepared to do experiments in electronics, chemistry, and biology over a two hour time period. We have been practicing these experiments for about six hours a week, and have already made all the mistakes that it is possible to make.

For example, in one rehearsal we learned that a tray that was to hold hot water had a serious leak, and we had a major flood, to the amusement of everyone (that's why papertowels were invented). We also practiced how to change over from one subject to the other with emphasis on fast cleanup, avoiding accidents, and setting up a buddy system if someone gets stuck. For example, student x will help student y if his set doesn't work.

In rehearsal, I also learned that some children could not blow up a balloon, and that some balloons broke. It was important that the child "keep cool" and have a definite plan if that happened to him, such as: ask for help from the teacher or a buddy; get a new balloon; or try again.

What you learn as a teacher is that you cannot take any skill for granted. Still, some children found it difficult to stretch the balloon over the neck of the bottle. After doing that procedure over and over, it became easy.

We expected problems in the biology portion, when we had to hold a live goldfish in a ball of wet towel and view the tail portion with its blood circulation under the microscope. The teacher wanted to keep the fish alive. The student might feel apprehensive that the fish would wiggle away and die. And we were under a certain amount of pressure because the parents would be watching.

A year's worth of science instruction, a week's worth of intensive rehearsal, and a final dress rehearsal on the day of the demonstration and will go into making parents day a time when each child can shine. Also, a large supply of materials such as balloons left over from a business promotion, paper towels, and goldfish will also go into the day.

At times it would seem that we were doing the experiments for the first time. Finally, we could move from one experiment to the other. These students of the third grade began to remind me of those famous dancers, the Rockettes at the Music Hall: Just as those dancers could all lift their legs in

unison, so my thirty students could work in unison, forged into a working unit, and completing experiments with precision and accuracy.

Noon: The parents arrive at twelve sharp and sit in chairs around the room, while the students are eating lunch. I have a chance to greet mothers, fathers, stepmothers, stepfathers, grandmothers, grandfathers, babysitter, nannies, and friends.

I welcome everyone and thank them for coming, for taking time off from work, or taking time to find a babysitter for younger children. I also explain that when the student's hand is up, the parent may walk over and see what the student is doing; that raised hand is an invitation to join the child.

Twelve-Thirty: The students are at the door now; they march to their seats and seem not to notice that there are some sixty relatives in the audience.

Part I: Electronics

Now the electronic sets are handed out. Each child opens his set, inserts the six 1.5 volt batteries (bump is plus) and organizes the red, blue, yellow and white wires by color. Up

to this point, the students do not know what experiment they will be demonstrating. I say, "open your manual to Experiment 43 at the top of the page, OSCILLATOR Circuits using L.E.D.'s.

The thirty students begin to work quickly, putting in the wires that connect the L.E.D.'s (diode light bulbs) to the batteries, the transistors, the capacitors and the resistors. The years of practice pays off now, as one by one, the hands go up. Parents stand by the student and see the red lights blinking 1 and 2 over and over again.

The joy is that all sets are functional, and all students can explain to the wide-eyed parents what was done, and why the numbers are blinking and changing.

Then the teacher shuts the classroom overhead lights and the classroom is somewhat darkened except for those tiny red lights. The teacher speaks:

Teacher: Completing the oscillator circuit was the easy part because we had the instructions. Now comes the hard part: Change the circuit to blink 3 and 4, there are no directions. The first one to discover it, put the connections on the blackboard. Keep in mind that there is more than one correct way to change the numbers.

The parents sit down again and the room is quiet. You could hear a pin drop. Now only three hands are up; the students are writing their circuits on the board. Now thirty hands are up. The Whole class can do it.

Teacher: The electronics portion of our demonstration is over; students please pack up and put away your sets and prepare for the chemistry portion of the demonstration.

[Teacher's Reflection - What joy that the children can follow directions (schematics) and then take a few cautious steps without directions and improve or extend the experiment]

Part II: Chemistry

Each child will now receive a glass soda bottle, a balloon, and paper towel, and a paper cup. Each child will stretch the balloon with his fingers, and fit the balloon over the neck of the bottle.

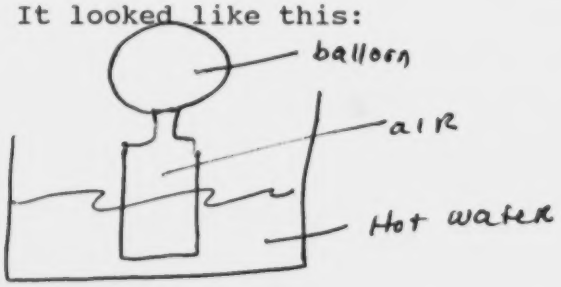
Teacher: Hands up if you know the answer! What is in the bottle and the balloon?

Student: Air

Teacher: When I raise my hand, partner near the window will put their soda bottle with the droopy balloon in the tray of hot water.

Teacher: When I raise my hand, partners near the door will put their soda bottle in the tray of ~~cold~~ Hot water.

It looked like this:




As the balloons begin to stand up, the children laugh.

Teacher: Who knows why the balloons are standing up?

Student: Hot air rises, and the balloons expand.

Teacher: Who knows why the balloons are droopy in the cold water?

Student: The air inside the bottle is at the bottom of the bottle. Cold air sinks and the balloon droops.

Teacher: Good for you. We have just witnessed a purely physical change brought about by the movement of air. Now we are going to have a chemical reaction take place in the same soda bottle and with the same balloon.

Teacher: Partner near the window will be given sugar and yeast cells. Please add these ingredients and water into your bottle and replace the balloon. Please add these ingredients and water into your bottle and replace the balloon. Please shake gently and note the time on the clock. When do you notice a change in the balloon, and why do you think this is happening?

Teacher: Partner near the door will be given baking soda and vinegar. Add these to your bottle, replace the balloon and note the time on the clock.

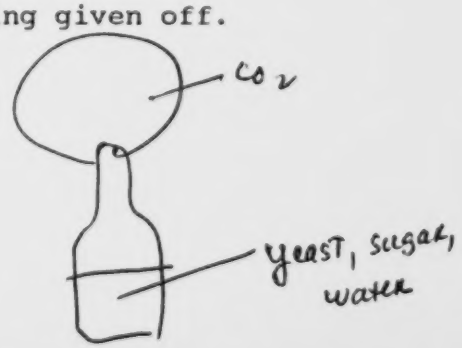
Teacher: Let's make note of the results. What is happening?

Student near window: My balloon is standing up after five minutes. It is still small.

Student near door: My balloon is very big, after five seconds. It may pop off.

Teacher: Please note that all the balloons are standing up now, but the baking soda balloons are bigger. How did this happen?

Student: Carbon Dioxide is being given off.



Teacher: Let's have a time reading on the Vinegar set up.

Student: Starting time 1:15, ending time 1:16. Time to stand balloon less than one minute.

Teacher: So you see that raising a balloon with chemicals is faster than using hot water.

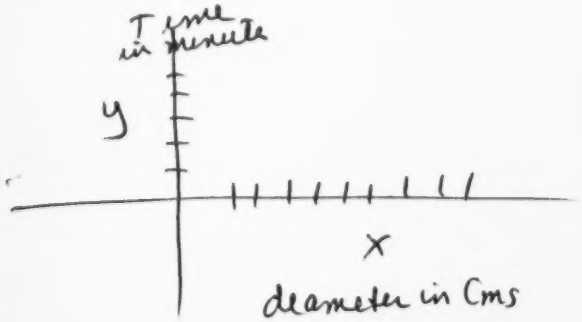
Teacher: Let's have the results on the Yeast/sugar combination. Time to start: 1:15
Time to End: 1:26

Teacher: It took 11 minutes to raise a balloon by the yeast/ sugar method. Who knows why?

Student: Yeast cells are slower in the rate they make Carbon Dioxide.

Teacher: Now we know three ways to raise a balloon.
Physically, by the use of hot air.
Chemically, by the use of baking soda and vinegar.
Biologically, by the use of yeast and sugar.

Teacher: If we had more time, we could graph the results using time on the y axis and diameter of the balloon for the x axis.



**Part III: Biology Portion**

Teacher: Now we are ready for the microscope study: Tables are wiped down, the glass bottles are in the sink, and the microscopes are handed out. Each child will receive a prepared slide, and focus. Raise your hand when you can share your clear image with your parent.

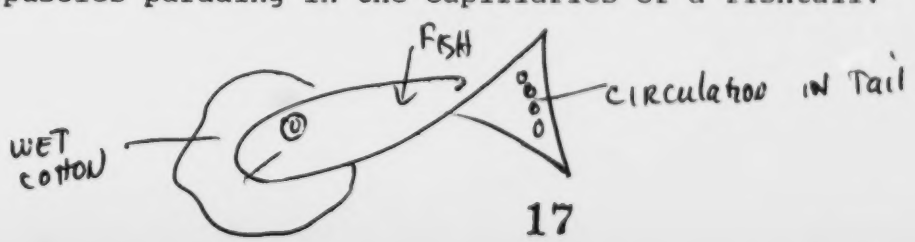
Parents walk over and look in the microscope as students hands go up.

Teacher: Now I will walk by and cut one hair from your head. Focus so that you can show your parent that hair is hollow like a drinking straw.

Teacher: This is the easy part because the objects to be observed are lying flat and quiet on the slide. Now we will observe blood moving in the tail of a living goldfish.

Teacher: Partner near the window will take a goldfish, wrap it in wet towel, and hold it on the stage of the microscope. Partner near the door will focus on the moving blood, very quickly.

Parents walk over and observe the steady parade of fish corpuscles parading in the capillaries of a fishtail.



Teacher: My thanks to the third grade for this remarkable two hour demonstration in electronics, physics, and chemistry, and biology. Time for some juice and cookies. You certainly earned it.

## A Special Student: Mechanical Genius at Work

## A Teacher's Diary

**Monday, July 20, 1987**

I met my special student and his mother outside the electronics store this past Friday at noon. School is officially "out", a time of boredom and loneliness for most gifted children. I made up my mind to give this boy some special attention this summer. His mother agrees to drive him; and purchase whatever special materials we may need.

Why am I doing this? This boy "sees" how machines work, and I want to help him develop the gift of mechanical genius. I had watched his interest grow over the years, from third grade when he was just another student in the class to the present level of ability in 6th grade.

On his lunch hour, he would come in to work on the huge broken computer; when I couldn't find him, he would be IN the computer. That broken clock, that worn-out radio, that toaster that didn't work was now working. That donated Oscilloscope with three sections and many wires was now connected without the manual, and generating sine waves and square waves. He had helped me, and this was my turn to help him.

As we walked into the store, there was a large demonstration robot in the window that had crumbled. Someone had touched it, and the pieces were just a jumble of rubble. We walked around the store and purchased a small "movit" robot, and were treated to a behind the scene tour by the technician on how they fix bigger robots and other electronic equipment.

As we are about to leave, the student says, "I could fix the demo in the window." The store manager agrees that he has nothing to lose, but expresses regret that he has no manual or instructions for the assembly.

With lightning speed, the student's fingers reassembled the red, gray, and black pieces into a working robotic arm, set gear into gear, and gear into lever. His requests from me were like a doctor to his nurse at the operating table: "I'll need a long nose plier." "Please bring a nine volt battery and two wires with leads."

"Finished," he says, "and now watch this!" As the student inserts the wires into two tiny holes, the robotic arm begins to move up, forward, and backward, and then around. First the whole arm moves to the right. "If I reverse the wires, I can make it move the other way". Now the whole arm moves to the left.

The teacher, the mother, and the store manager are wide eyed.

Teacher: I see it but I do not believe it.

Mother: Should I buy this set? It is very expensive.

Teacher: If you can buy it, you should. It will help him to take it apart and put it together several times. We've got a winner here, and it is less than the cost of summer camp.

Student: What do you think?

Teacher: You did very well. Can you build this from scratch?

Student: Yes.

Teacher: O.K. Your mom just bought this set.

Student: Neat-O! (means great, good)

Teacher: I will meet you in two weeks at the school, and I expect to see this set completed.

Student: There are many projects, which one do you want?

Teacher: Do all of them!

Teacher to Mother: He must go to the library and read books on machines. He must put the set together <u>slowly</u> and be careful not to drop pieces. He must put the set away carefully; cleanup and packing is very important.

Teacher to Herself, overwhelmed: I've been teaching for many years, but I new saw anything like this. The mechanical genius simply sees how the pieces are put together, and the hands do what they are told, and the machine works.

October, 1987

The student has brought in a homemade Robot that is his own construction from spare parts of old broken machines. It looks like a traveling garbage pail with an arm. He demonstrates how the arm works.

I ask him if he would enter his robot in a contest called the INVENTION CONVENTION which is being run by the patent office in Washington, D.C. He takes the application home.

February 22, 1988 (Winter Recess)

The student and I will attempt to fix and operate an old oscilloscope lent to us by the South Huntington School District. It works but it must be the first one ever built. It was found in the basement and it has vacuum tubes inside!! It must be from 1944-, a mechanical Dinosaur.

March 12, 1988

"The Robot and Official Buddy" has been accepted for the Invention Convention, and is on its way by Federal Express to the Science Museum of the State of New York in Albany.

We practice questions and answers that he will be asked by the judges:

Teacher: What can this robot be used for?

Student: Well, this arm could feed a disabled person if you fit it with a spoon; or it could paint, if you fit it with a brush; or it could write, if you fit it with a pencil.

The student now demonstrates how the arm turns, bends, and rotates; how it opens the hand portion and closes, and by reversing the wires, changes the direction of the rotation.

Teacher: You will receive a patent for your effort. I have advised your mother to keep these papers for your record, and someday we will use them to help you enter a special college.

Student: What college?

Teacher: New York Institute of Technology or Massachusetts Institute of Technology. I'd like to see you build bigger and better things.

June 27, 1988

The Robot will be taped for CBS Television in August. There will also be a creative session where children will be asked to compete in a problem solving contest. This should be fun.

The student and his mother will soon be at our school, LISG, and we will continue the usual summer study: mechanics, electricity, and electronics. Room 408 is full of broken machines, hairdryers (a good source of springs), clocks (a good source of gears), and toasters (good source of mica). School is "out" now, and the halls are quiet, second summer session is on.

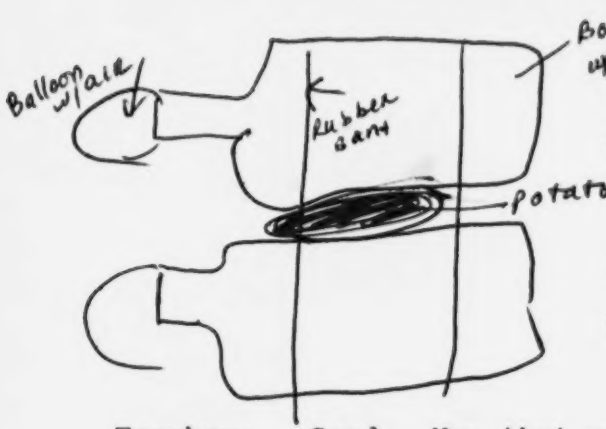
Is there any way we can prepare for this television dubut? I suppose the best way is to solve general type problems:

Teacher: Here is this big brown potato. Build a boat that will float the potato.

Student: What can I use?

Teacher: Anything in the room.

There is the construction that floated the potato:




two soda bottles

two balloons

air in soda bottles

rubber band

potato.

Teacher: Good. Now that we are floating, what can we do to this to make it move in the water?

Student: Do we have a propeller, a battery, and two wires?

Teacher: Yes.

Student: Then we're moving, watch this!

Teacher: We are moving backward. How can we move forward.

Student: Easy, reverse the wires on the battery.

Teacher: O.K. We're moving forward.

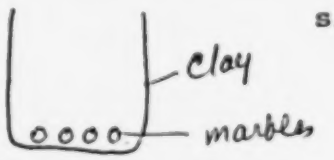
Teacher: Next week, I want you to build this glider plane and we will discuss things that fly; also I want you to build a pinwheel from paper; also, try to make a little car from a spool of thread and a rubber band. See you next week.

July 11, 1988

Teacher: Here is a lump of clay and six marbles. What can you build that will float the clay and marbles?

Student: This clay is gross and sticky.

Boat 1 sinks immediately




Teacher: Remember the bottles from last week? What was in them that floated the potato?

Student: AIR.

Teacher: Try again, but make an air pocket.

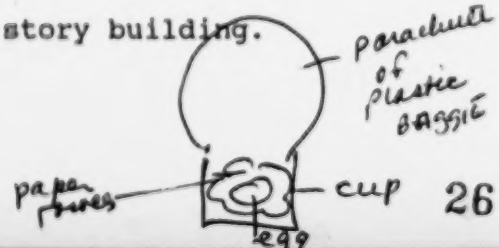
Boat 2 floats 8 minutes

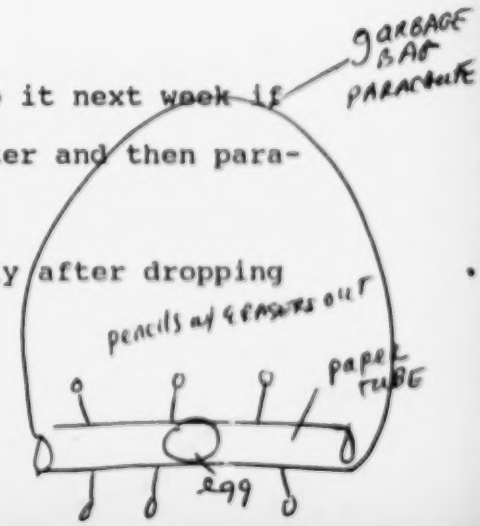
Teacher: Another teacher gave me this problem. How could I throw a raw egg in the air and have it hit the ground without breaking?

Student: Impossible

Teacher: Try again. Think I bet we can do it next week if we put the egg in a balloon of water and then parachute down. It's worth a try.

See diagram of two plans to land an egg safely after dropping it from a 2 story building.



Teacher: I want to tray a paper propeller on that glider plane. Also, I think we'll build a motor from a few paper clips, some wire, and batteries. Remember, you can always use the air, and static electricity. It is like "the given" in a geometry problem. It is there for everyone if they're aware of it.

Student: See you next week.

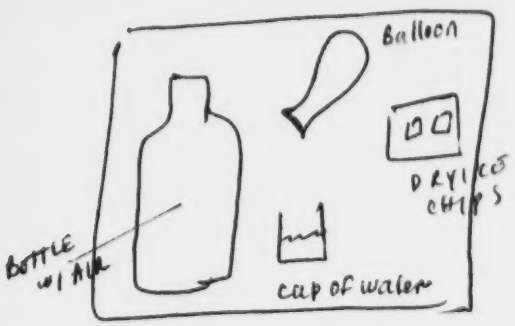
Teacher (to self): I think we'll start with periodic tables just to warm up.

## A TYPICAL DAY IN SCIENCE CLASS

### Third Grade: Balloons and Bottles

I decided to try a variation of the experiment used for parents day last year. Again, balloons and bottles were used, but this time I wanted something more dramatic. Also, I wanted to teach a value called "equanimity" which simply stated means that a student must remain matter-of-fact and not show undue emotion when doing experiments. Modern students might say that they must "keep their cool". But it really means that extreme joy, extreme disgust, or extreme excitement really has no place in the lab and obstructs thinking and analysis.

Here are the materials each child received along with a few chips of dry ice and a small amount of water in a cup:




set up: paper towel
bottle
balloon
cup of water
dry ice chips on paper towel.

Teacher: Each child will put the dry ice chips in the paper towel using the towel to avoid skin contact. Then carefully pour the water from the cup into the bottle. Immediately put the balloon on the neck of the bottle.

The combination of dry ice and water produce a large amount of carbon dioxide to be generated in a very short time. The balloons expand rapidly, pop off, and hit the ceiling.

Teacher: Wait for your balloon to hit the ceiling, and fall to the floor. Pick it up and replace it on the bottle neck. It will hit the ceiling again

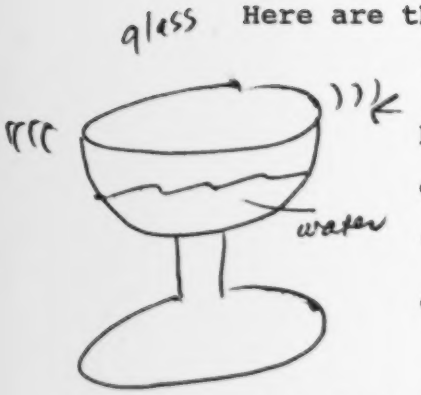
Teacher: Anyone who acts in a wild manner will lose his materials. Read, go.!

To watch the children "calmly" sit there while the balloon hit the ceiling, and "calmly" sit there and replace the balloon on the bottle again, is to witness a lesson in self control.

All the students were able to see their personal balloon hit the ceiling several times. Sorry to say that class is over.

**Second Grade: Lesson on Wave Motion, last day of School.**

It is June 6, 1987, the very last day of science class, and we are repeating the experiment done on the very first day of class on September 12, 1986. The reason for repeating the exact lesson is to come full circle and help each child see how much progress he has made.




Here are the materials each child received:

paper towel

glass

"champagne" glass with long stem

cup of water

Last September, there was real danger that the glass might break and fall; that the student could not generate a wave motion we could hear; and that the student would talk and lose concentration.

Teacher: Pour the water into the glass champagne glass, be careful not to spill it. Hold the glass loosely with the left hand. Wet the pointer finger of the right hand and rub the finger around the rim of the glass. Keep your mouth closed and ears open. What do you hear?

The children know better now exactly what to do. Each little finger is working, each glass is generating a wave motion from the glass to the water and to the air. Each little mouth is closed and ears are open to the now audible sound: HMMMMMMMMMM.

What happened in the course of the year was this: In the physics portion, we studied light waves, sound waves, and heat waves. We hit a slinky and generated a wave motion that you can see. We waved our hands, and formed a human wave like people do at the baseball game. We looked at puddles on rainy days when rain drops make circular wave motions in the street. We made circular wave motions using an eye dropper and a cup of water. We built a radio, and picked up sound waves in the air. We built a transmitter, and sent our voice across the room. We talked about ocean waves, air waves, and, of course, brain waves. Finally, we saw waves on that very old oscilloscope. What we came to realize is that waves are everywhere, and the waves we make in vibrating glass and water are fun and we can do it again and again at home.

**First Grade: Using Thermometer**

The first grade is coming in now, and although this class is somewhat larger than the others, we still do several hands-on experiments each class period (about 1 hour long).

We had completed our introduction to the thermometer earlier this year, and each child can read a thermometer in Centigrade and Farenheit.

In the past, we made the mercury in the thermometer rise and fall by holding it in our hand. We learned that a reading of 98 Farenheit is the equivalent of 22 Centigrade when talking about body temperature. And we can demonstrate the rising and falling of the mercury over and over again.

Letters were sent home to parents, asking their cooperation in providing a wall thermometer for each child's room. They were asked to point out car thermometers, house thermostats, refrigerator and stove thermometers, and gages on such things as toasters and hairdryers and clothes dryers.

The children are sitting up, mouth's firmly shut, hands in lap, waiting for the distribution of materials. The best sitters will get the materials first, and they know that if they waste one Precious Minute now, we will wish we had it later.

Here are the materials each child received:

paper towel
thermometer
cup of water
regular water ice cube
dry ice cube

Teacher: As soon as you receive your materials, take the temperature of the $H^2O$ ice cube and then the dry ice.

Teacher: Take the temperature of the water with no ice in it. Then place the ice in the cup of water and read the thermometer again. I will call for readings

Student: Regular ice reads +20F, Zero C.

Student: Dry ice reads +20F -30C.

Teacher: Now I will give each child two pennies. Put one penny on the dry ice cube and one penny on the water ice cube. I will call for results

Student: The penny is sinking into the water ice cube.

Student: The penny is turning white and making a noise on the dry ice.

Teacher: Now I will give each child two strips of blue litmus. Put one strip on each ice cube. I will call for results.

Student: Blue litmus remains blue on water ice cube.

Student: Blue litmus turns red on dry ice cube.

Teacher: We will do the conclusions tomorrow. Time to clean up. Sorry to tell you that class is over.

**Kindergarten: Playing Traffic Lights**

The kindergarten class walks into the room ready to write the word of the day. The notebook is open, and the temperature in the room is recorded from the wall thermometer. Every day

we write or draw a small picture about the weather: For example, if it is a nice day we draw a sun, if it is a rainy day we draw a rain cloud.

Today's word is L.E.D. That is all we write. Then we repeat the word L.E.D. which means Light Emitting Diode.

Teacher: Today we are going to use your electric sets to build a circuit using a green light bulb and a yellow one; these are regular Edison bulbs such as you would have in your home. But the red one is a L.E.D. When you complete the circuit we will play a game called traffic light. In ten minutes the fifteen wires have been inserted and all sets are functional. We are ready for the game.

Teacher: I am so proud of you. Walk carefully to the center of the room, with your electric set and sit on the floor. I will shut the overhead lights off.

Teacher: Now you are going to tell the cars on the road what to do.

Teacher: ALL GREEN LIGHTS ON.

Students: Hmmmmmmmmmm (making the noise of moving cars)

Teacher: Tell the cars to slow down (green light off, yellow light on)

Students: Hmmmmm (slowing down)

Teacher: Now tell the cars to stop (yellow light off, Red (L.E.D. on)

Students: (Silence)

Teacher: Time for all the cars to get going again. GREEN LIGHTS ON (which means L.E.D. must be off).

Sorry to tell you that class is over. When the children leave the room, I ask them a question.

Teacher: What is a L.E.D.

Student: Light Emitting Diode

Student: A red light

Student: A small light

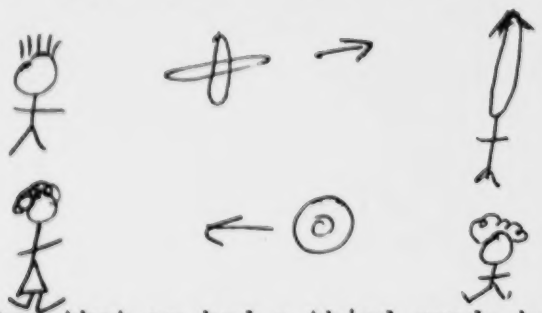
**Teacher Reflection:** This Kindergarten class has completed an electronic experiment and now they are <u>playing</u> with it. Games are the natural mode of children, and any teacher who can incorporate play into learning has greatly enriched both.

## SUMMARY & CONCLUSION

Science at LISG is a hands-on experience, where children do the work and the teacher assists learning. Parents are part of the learning team. Students get private instruction in areas of interest such as science or music. Playing and learning are often fused together, and the time flies. "Is class over so soon?" is a familiar question.

The best part of science instruction for the gifted is that race, age, size, and gender disappear with time and the only factor that remains is: Can this team solve the problem at hand?

One final example shall suffice this paper. Four children were able to work on aerodynamic problems such as paper planes, kites, helicopters, boomerangs, and flying rings. We had constructed a wide variety of flying devices all winter long and were ready to fly these devices outdoors. We made <u>two rows</u>, and the students were able to sail the devices with a minimum of time lost



It did not matter that we had a third grade boy flying a plane to an eighth grade boy. It did not matter that a very tall fourth grade boy was flying a ring to a very short oriental girl.

We were now a "Company of Scholars"[1] who were now testing and recording data to determine <u>how far</u> a device could go, or <u>how high</u> a device could go. I thank my school for giving me the opportunity to teach this way.

and Thanks to you for coming into my classroom.
Sincerely, Joyce L. Acker

[1] Quote Professor Tannenbaum, Columbia University.